UNIVERSITI TEKNOLOGI MARA Cawangan Perak

KUTAI

GRESAFE_CITIES
Green Safe Cities, Research Group

6th UNDERGRADUATE SEMINAR ON BUILT ENVIRONMENT AND TECHNOLOGY (USBET) 2023

SUSTAINABLE BUILT ENVIRONMENT

25 - 27 SEPTEMBER 2023

E-PROCEEDING

USBET 2023

e-Proceeding

6th UNDERGRADUATE SEMINAR ON BUILT ENVIRONMENT AND TECHNOLOGY (USBET) 2023

SUSTAINABLE BUILT ENVIRONMENT

Published by,
Department Of Built Environment Studies And Technology
Faculty Of Architecture, Planning & Surveying
Universiti Teknologi MARA Perak Branch, Seri Iskandar Campus
usbet.fspuperak@gmail.com

eISSN 2821-3076

02 October 2023 | Perak, Malaysia
Universiti Teknologi MARA, Perak Branch, Seri Iskandar Campus

EDITORIAL BOARD

Editors-in-Chief

6th Undergraduate Seminar on Built Environment and Technology 2023

- E- Proceedings-

Organized by,

College of Built Environment (KAB) UiTM Perak Branch

THE EFFECTS FROM THE USAGE OF CONSTRUCTION MATERIALS TOWARDS THE ENVIRONMENTAL DEGRADATION

Nurelisma Sharina Rozmi[1], Natasha Khalil[1]*

[1]Department of Built Environment Studies and Technology,
College of Built Environment,
Universiti Teknologi MARA, Perak Branch,
32610, Seri Iskandar, Perak, Malaysia

nurelismasharina@gmail.com,*natas582@uitm.edu.my

ABSTRACT

The selection and application of construction materials has a significant impact on the outcome and sustainability of construction projects. It contributes towards the effects of construction materials on a variety of aspects like environmental sustainability and human health. The selection of suitable materials is critical in determining the project's environmental footprint, as traditional materials frequently contribute to high carbon emissions. Therefore, this research aims to identify the effects from the usage of the construction materials towards the environmental degradation and to suggest the best strategies to overcome the problems. The data were collected from the respondent through online questionnaire survey. A total of 137 questionnaire disturbributed to the Architects and Engineers in Pulau Pinang that works at registered firms with Board of Architects Malaysia (LAM) and Board of Engineers (BEM) and received 45 responses. The findings revealed that the construction materials have a big impact on the environment and some strategies in selection of construction materials has been suggested and it is hoped that the findings contributed to the awareness and implementation of more sustainable and eco-friendly practices in the construction industry.

Keywords: *green construction materials, environmental degradation, greenhouse gas emission, waste generation, recycled materials.*

INTRODUCTION

In Malaysia, construction industry is the most profitable sector to the national economy and among the most fastest growing sector. According to Hillebrandt (2000) construction industry is a key sector of the economy for every country. Ofori (2012) added construction sector contributes to national socio-economic development by providing the buildings which are used in the production of all goods in the economy. Along with technological and developing advancements, our country is no exception from experiencing rapid development in order to meet the needs and desires of its people. Malaysia's economy must function productively and effectively in order to achieve an identity that represents a developed country. This is supported through national agenda in the Twelfth Malaysia Plan (2021-2025) that the government green procurement initiative will be expended to state government and local authorities and it is expected to increase to 25 per cent by 2025.

Without realizing all the effect of the material used in the construction, the construction industry keeps advancing. Despite the rapid development, there are some problems that harm the lives of the community. The problem of environmental pollution due to unplanned construction has become a major issue (Omardin & Abidin, 2014). The threat of pollution to the environment is the deterioration of the environment that can be seen physically and socially. Therefore, in order to decrease the negative environmental effects of buildings, the construction industry has created sustainable building approaches, where buildings play an important role in greenhouse gases, massive energy, and water use and large land use are important (Altuma and 2 Ghasemlounia 2021). This is supported by Buildabroad (2017) sustainable buildings take advantage of the natural resources available and depend on a “green” choice of materials.

The construction of high -rise buildings or urbanization that are generally based on various type of materials that is happening across the country has caused many negative impacts on the environment. As a result, it has threatened the natural ecosystem. This development has a significant environmental impact in terms of climate, pollution, logging, and hillside. There are several effects of the construction materials to the sustainable environment. Therefore, the relevant stakeholders should take an initiative to reduce the harm to the environment and enhance the quality of life. This is also to ensure that the sustainability can still be maintained even though there is still a lot of development to be done.

METHODOLOGY

The type of data collection used for this research is quantitative method. The data was being collected from a questionnaire survey and the respondents are Architects and Engineers in Pulau Pinang that works at registered firms with Board of Architects Malaysia (LAM) and Board of Engineers (BEM). Based on Raosoft, the sample size for the population is 137, so, 137 questionnaire have been distributed through Google Forms and received 45 renponses. A five-points Likert-scale is used for the items in the questionnaire that ranged from 1-very disagree to 5-very agree. Next, the analysis done by using Statistical Package for Social Science (SPSS) Version 26. The analized data were presented in the form of frequencies and median rank.

The limitation of this study are respondents, location and time, and it relies on a questionnaire survey as primary data collection method. The time allocate for data collection is limited, as it must completed within a semester. Furthermore, the questionnaire survey will only cover a small sample size of professionals in Malaysia, as well as geographical area. As a result, the study uses the purposes sampling technique to determine the sample sie for the purpose of gathering data.

ANALYSIS

Demographic Background

The age distribution of respondents indicates that the number of respondents aged 21-23 years is (4.4%) of the total respondent aged 24-27 is (37.8%) of the total and respondent over 28 years is (57.8%) of the total respondents. majority of the respondent or 57.8% is an Engineer while the other 42.2% is an Architect. Most of the respondent have experience of working in the industry within 1-5 years by 55.6% while the respondents with the experience of 6-10 years and over 10 years is 15.6% and 28.9% respectively. Other than that, the highest percentage of the total number of the project involved or handled by the respondent indicate that majority of the respondents had handle 0-5 projects with 42.4%. 40% of the respondent had involved in 6-10 projects, while 15.5% is for 11015 projects and lastly 2.2% for the total projects of 21-25 projects.

Table 1: Demoghraphic background

Item	Description	Frequencies	Percentage (%)
A	Age		
	21-23	2	4.4
	24-27	17	37.8
	28 and above	26	57.8

B	Job position		
	Architect Engineer	19 26	42.4 57.8
C	Working experience		
	1-5 years 6-10 years Over 10 years	25 7 13	55.6 15.6 28.9
D	Total numbers of project involved or handled		
	0-5 projects 6-10 projects 11-15 projects 21-25 projects	19 18 7 1	42.4 40.0 15.5 2.2

Effects from the usage of the construction materials

Table 2 shows the rank of mean and for the effects from the usage of the construction materials towards the environmental degradation. From the table above, it can be concluded that the highest rank of mean for the effects is 4.42 which for environmental pollution. From here, we can see that the respondents think the usage of the construction materials in the construction sector causes environmental pollution. Besides, the second rank of mean for the effects is 4.36 which is the use of the construction materials causes problems in construction waste disposal. Other than that, the mean of the usage of construction materials causes health problems rank third with 4.31. Lastly, fourth rank of mean for the effects is the usage of the building materials causes air pollution and increase heat which is 4.29.

Table 2: Effects from the usage of the construction materials towards the environmental degradation.

Item	Description	Mean	Std deviation	Rank
1	The use of construction materials in the construction sector causes environmental pollution.	4.42	1.097	1
2	The use of construction materials causes air pollution and increased heat.	4.29	1.121	4
3	The use of construction materials causes problems in construction waste disposal.	4.36	0.957	2
4	The use of construction materials causes the health problems.	4.31	0.973	3

Strategies in selecting construction materials towards reducing effects to the environmental degradation.

Table 3 shows the rank of mean for the strategies in reducing effects to the environmental degradation. The highest rank of mean for the strategies is 4.69 which is encourage the suppliers in the construction materials to increase the production of the green materials can reduce the environmental degradation. Next, mean of 4.67 rank second which is encourage the industry players to use green material in their project so that it can reduce adverse effects to the environment. After that, minimize waste disposal of the construction materials rank third in the mean rank with 4.64. Provide more education programme related to the green material can enhance the awareness about the importance of using green materials and come out with a good strategy can overcome the problems of environmental degradation caused by construction material rank fourth and fifth with mean 4.62 and 4.60 respectively.

Table 3: Strategies in selecting the construction materials towards reducing effects to the environmental degradation.

Item	Description	Mean	Std deviation	Rank
1	A good strategy can overcome the problems of environmental degradation caused by construction material.	4.60	0.654	5
2	Provide more education programme related to green material can enhance the awareness about the importance of using green materials.	4.62	0.614	4
3	Encourage the suppliers in the construction sector to increase the production of the green materials can reduce the environmental degradation.	4.69	0.633	1
4	Encourage industry players to use green material in the project can reduce adverse effects to the environment.	4.67	0.640	2
5	Minimize waste disposal of the construction materials can reduce the environmental degradation.	4.64	0.645	3

DISCUSSION

Objective 1: Effects from the usage of the construction materials towards the environmental degradation.

From the data analysis of table 2, it is found that the most obvious effect from the usage of the construction materials that have agreed by the respondents is the use of construction materials in the construction sector causes environmental pollution. The construction industry has a significant environmental impact such as a scarcity of global resources and environmental degradation (Chen et al. 2021). Environmental pollution can be caused by the resource extraction, deforestation, waster generation, energy consumption for the transportation of the materials, and chemical pollutants from the materials itself. Forests are being wiped out on a massive scale to meet the demand for various urban facilities (Nuruzzaman, 2015).

Next, the respondents agreed that the second effect from the usage of construction materials to the environment is the use of construction materials causes problems in construction waste disposal. This is supported by Guo et al., (2018), Due to the increasing in construction waste, recycling of waste concrete has become an important issue worldwide. Among the problems is it faced problem in volume and space constraints of the waste, improper disposal practices, improper handling of material that can be hazardous and recycling and resources recovery.

Lastly, the third most obvious effect from the usage of construction materials to the environment that has been choose by the defendants is the use of construction materials causes the health problems. Chen et al., (2021) said that rapid urbanisation has had a significant impact on the ecosystem and human health. Among the factors is dust and particulate matter generated during the construction process, demolition activities, allergies and irritation caused by the materials itself, noise pollution and material containing chemical.

Objective 2: Strategies in selecting construction materials towards reducing effects to the environmental degradation.

From the data analysis of table 3, it is found that the most effective strategies in selecting the construction materials towards reducing environmental effect is by encourage the suppliers in the construction sector to increase the production of the green materials. Mahmoudkelaye et al, (2018), Sandanayake, (2020) mentioned sustainable materials are thought to be extremely important in the achievement of environmentally sustainable construction projects in order to reduce their environmental impact. It can be achieved by encourage research and development on producing more green materials, through government support and financial incentives, collaboration and partnership and market demand awareness.

Furthermore, the second most effective strategies in selecting the construction materials towards reducing environmental effect is by encouraging industry players to use green material in the project. this can be done by providing educational programme about the implementation of the green building materials. This is supported by Johnson et al (2019), it is important to provide more education and raising awareness of the benefit of green materials. Besides, financial incentives and certification and setting standard of the sustainable building can enhance the implementation of green materials in the projects by the industry players.

Next, the third strategies in selecting the construction materials towards reducing environmental effect choose by the respondent is minimize waste disposal of the construction materials. waste minimisation is an important area of concern in the implementation of the construction waste management in the construction industry of Malaysia (Begum et al., 2006). As the construction waste management has become a global problem, there must be a step taken to overcome it. Practice the concept of '3R' which is waste reduction (reduce), reuse and recycle. As mentioned by Chen et.al (2006) among the building materials that can be reused in the construction work are bricks, tiles, and concrete mould made of wood. Besides, doing good maintenance and designing the construction taking into account the overall cost to avoid wasting materials also can minimize the waste disposal.

CONCLUSION

To summarise, the selection and application of construction materials has a significant impact on the outcome and sustainability of any construction project. The appropriate material selection not only determines the structural integrity and durability of the building, but it also has significant environmental and economic implications. Moreover, construction materials have huge effects on the project's environmental footprint. Traditional materials, such as concrete and steel, emit significant amounts of carbon dioxide during their manufacturing processes, contributing to climate change. However, advancements in environmentally friendly and sustainable materials, such as recycled materials, provide alternatives with lower embodied energy and lower carbon footprints. Using these materials can help promote environmentally responsible construction practises and reduce the industry's environmental impact.

Based on the analysis that have been made, there are some suggestions of recommendation for this research study. To improve the study on this topic, the future research can be done by focusing on other scope of topic green building materials in the construction industry. Further researcher could do investigation on types of green building materials, the production of the materials, benefits of using green materials, and critical success factor in the implementation of green materials in construction industry in Malaysia.

ACKNOWLEDGEMENT

We would like to express profound gratitude to Universiti Teknoigi Mara (UiTM), Perak Branch for providing the resources and support that enabled this research to take place. A special thanks also goes to the respondents who willingly contributed their precious time and knowledge, allowing this study to be completed.

REFERENCES

Altuma, M. I., & Ghasemlounia, R. (2021). Effects of construction materials to achieve sustainable buildings, *International Journal of Engineering and Management Research*, 11(1), pp. 25-30.

Akbari, H., Pomerantz, M., & Taha, H. (2001). Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. Solar energy, 70(3), pp.295-310.

Buildabroad, Sustainable Materials: The Backbone of Any Sustainable Building Project, 2017, https://buildabroad.org/2017/08/15/sustainable-materials.

Cai, J. W., & Sun, J. (2014). Brief discussion on green building materials. IOP Conference Series: Materials Science and Engineering, 62(1).

Calkins, M. (2008). Materials for sustainable sites: a complete guide to the evaluation, selection, and use of sustainable construction materials. John Wiley & Sons.

Castro-Lacouture, D., Sefair, J. A., Flórez, L., & Medaglia, A. L. (2009). Optimization model for the selection of materials using a LEED-based green building rating system inColombia. Building and environment, 44(6), 1162-1170.

Chen, Z. S., Yang, L. L., Chin, K. S., Yang, Y., Pedrycz, W., Chang, J. P., ... & Skibniewski, M. J. (2021). Sustainable building material selection: An integrated multi-criteria large group decision making framework. Applied Soft Computing, 113, 107903.

Guo, H., Shi, C., Guan, X., Zhu, J., Ding, Y., Ling, T. C., ... & Wang, Y. (2018). Durability of recycled aggregate concrete–A review. *Cement and concrete composites*, *89*, pp. 251-259.

Hillebrandt, P. M. (2000). *Economic theory and the construction industry*. London: Macmillan.

Huo T., Ren H., Zhang X., Cai W., Feng W., Zhou N., Wang X. (2018). China's energy consumption in the building sector: A statistical yearbook-energy balance sheet based splitting method Journal of Cleaner Production, 185 (2018), pp. 665-679.

Ismail, N. A., Khalil, N., Sani, S. I. A., & Husin, H. N. (2023). Strategies to Enlarge the Market Availability of Green Building Materials (GBM) for Construction

Works: Gathering the “Low-Hanging Fruits”. *Research in Management of Technology and Business*, *4*(1), 1374-1387.

Khalil, N., Bohari, A.A.M, Shamsudin, S.M., Rashid, A.F.A., Husin, H.N. (2021). Key Approaches of Life-Cycle Cost in Green Government Procurement (GGP) for Green Projects. Journal of the Malaysian Institute of Planners, 19(2), pp. 27-38.

Melchert L. (2007). The dutch sustainable building policy: A model for developing countries? Building and Environment, 42 (2) (2007), pp. 893-901.

Mukhopadhyay, A., & Pandit, V. (2014). Control of industrial air pollution through sustainable development. *Environment, development and sustainability*, *16*, 35-48.

Nitivattananon, V., & Borongan, G. (2007, September). Construction and demolition waste management: current practices in Asia. In *Proceedings of the International Conference on Sustainable Solid Waste Management*, pp. 5-7.

Nuruzzaman, M. (2015). Urban heat island: causes, effects and mitigation measures-a review. *International Journal of Environmental Monitoring and Analysis*, *3*(2), 67-73.

Ofori, G. (2012). Developing the Construction Industry in Ghana: the case for a central agency. *A concept paper prepared for improving the construction industry in Ghana. National University of Singapore*, *13*(1), 3-18.

Omardin, M. A., Abidin, N. Z., & dan Perancangan, B. (2014). Konsep dan amalan kesedaran terhadap isu-isu alam sekitar di peringkat awalan projek pembinaan melalui fasa pengurusan nilai. In *Social Sciences Postgraduate International Seminar (SSPIS)*.

Rizwan, A. M., Dennis, L. Y., & Chunho, L. I. U. (2008). A review on the generation, determination and mitigation of Urban Heat Island. *Journal of environmental sciences*, *20*(1), 120-128.

van Thienen, G., & Spee, T. (2008). Health effects of construction materials and construction products. *J App Occup Sci*, *14*(13), 2-23.

Yang L., Yan H., Lam J.C. (2014). Thermal comfort and building energy consumption implications–a review Applied Energy, 115 (2014), pp. 164-173.

Yang, L., Qian, F., Song, D. X., & Zheng, K. J. (2016). Research on urban heat-island effect. *Procedia engineering*, *169*, 11-18.

Zhao, H., Wang, Y., Qiu, W., Qu, W., & Zhang, X. (2018). Research on the Application of Green Building Materials in China. IOP Conference Series: Earth and Environmental Science, 186(2)

Pejabat Perpustakaan
Librarian Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak

Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR